

5. SEVERE INJURIES

5.1 SOFA-defined Severe Injuries and Amputations

'Severe Injuries' were defined¹¹ by the SOFA Working Group (SWG) as (1) potentially life threatening; (2) high likelihood of permanent loss of function, permanent occupational limitation, or other permanent disability; (3) likely to result in significant work restrictions; and (4) result from a high-energy impact to the human body. 'Severe Injuries' include amputation, dislocation of the neck, loss of eye, electric shock or burn, and fracture to any bone except the lower arm, fingers, foot, and toes. Tables 5-1 and 5-2 describe Severe Injuries as defined by the SWG.

Table 5-1. Definition of SOFA-defined Severe Injuries

Type	Body Location
Fracture	Upper arm, upper leg, knee, lower leg, ankle, heel, eye, skull, neck, spine, upper back, lower back, shoulder, collar bone, rib/rib cage, hips, and multiple fractures
Amputation	Any body part
Dislocation	Neck
Loss of eye	One or both
Electric Shock/burn	Eye, ear, nose, mouth/teeth, skull, and neck
Other burn	Eye, ear, nose, mouth/teeth, skull, and neck

¹¹ See *Severe Injuries to Train and Engine Service Employees: Data Description and Injury Characteristics*. July 2001. This report may be found on the FRA's Web site.

Table 5-2. Type of Information Available for Severe Injuries

#	Information Type	Variables
1	Record identification	-Incident number
2	Date and time	-Date of injury occurrence -Time of injury
3	Railroad	-Reporting railroad -Type railroad: ICC categories
4	Geographic location	-City, county, and state -FRA designated region
5	Reporting extent	-Whether additional FRA forms were filed
6	Work missed	-Days absent or restricted -Whether employee was suspended or transferred
7	Hazardous material exposure	-Whether injury involved exposure to hazardous material
8	Alcohol and drug testing	-Number of positive alcohol and drug tests
9	Employee	-Type person injured, i.e., "employee on duty" -Job occupation, i.e., "road conductor " -Age
10		-Type and location of injury -Whether death occurred
11	Circumstance codes	-Physical act worker was doing before injury -General location of worker before injury, i.e., yard, main/branch -Specific location of worker before injury, i.e., beside track -Equipment location, i.e., freight car moving, locomotive standing -Event causing injury, i.e., lost balance, slipped... -Tools, machinery, appliances, structures, surfaces (etc.), i.e., ground, ballast -Injury cause, i.e., human factors, environmental, equipment
12	Written description	-Narrative

5.2 Information Available for SOFA-defined Severe Injuries

In issuing its report at the conclusion of its study of Severe Injuries, the SWG said:

The SOFA Working Group has looked at the injury data from the perspective of the knowledge gained from its detailed investigation of FEs where the circumstances surrounding, and leading up to, a FE were identified. The SOFA Working Group realizes that Serious Injuries are not investigated the way FEs are; hence, it is not always possible to identify these circumstances. The implication of this is clear: it is not possible for the Working Group to tell if one or more of its five safety recommendations applies to a particular Serious Injury event.¹²

¹² *ibid*

5.3 History of Severe Injuries

The seven-year history of SOFA-defined Severe Injuries is shown in Table 5-3 along with amputations, an acute form of Severe Injuries. Since 1997, on average, 132.7 Severe Injuries have occurred each year. These Severe Injuries include, in addition to amputations, fractures of bones other than fingers and toes. As such, Severe Injuries often result from high-energy impacts and can be career threatening. Severe Injuries can be defined back to 1997 with the revision of reporting form FRA F6180.55a.

In 2003, there were 116 Severe Injuries, the lowest count in the seven-year period, 1997 through 2003; and 14.4 percent lower than the mean of 135.5 for the previous six years. There have been 46 Severe Injuries in January through April of 2004.

Table 5-3. SOFA-defined Severe Injuries and Amputations, 1997 through April 2004¹³

	SOFA-defined Severe Injuries								Amputations							
	1997	1998	1999	2000	2001	2002	2003	2004	1997	1998	1999	2000	2001	2002	2003	2004
JAN	11	13	16	15	21	12	11	10	1	0	2	1	0	0	2	2
FEB	17	15	9	9	9	13	17	14	0	1	0	1	0	2	1	2
MAR	14	12	17	11	10	10	13	10	3	4	3	2	1	1	3	1
APR	8	10	6	10	12	6	9	12	1	2	0	1	2	0	1	1
MAY	6	12	8	8	12	14	10		1	2	3	0	2	2	2	
JUN	9	10	8	11	8	5	10		2	1	1	0	1	0	0	
JUL	9	14	10	8	10	7	6		1	5	1	0	4	0	1	
AUG	13	10	11	14	8	10	7		1	0	1	4	0	1	0	
SEP	10	11	15	10	20	12	5		2	4	3	2	5	4	0	
OCT	12	12	16	10	5	11	9		2	5	2	2	0	0	2	
NOV	12	9	12	11	13	14	10		2	2	2	2	3	0	1	
DEC	18	9	7	22	12	9	9		4	1	0	4	1	1	2	
totals	139	137	135	139	140	123	116		20	27	18	19	19	11	15	

5.4 Severe Injuries by Selective Attributes and Track Location

Using the Severe Injury data for the period from January 1, 1997 to December 31, 2003, the frequency of selective attribute variables were calculated based on the track location where the injury occurred. For instance, the frequency of occurrence for the job code related to the injured employee was calculated based on seven track locations: yard, mainline/branch line, industry, siding, highway/roadway, passenger terminal, and other. Other attributes for which the frequency of injuries are calculated by track location: injury type; body location of injury; year; month; day; time of day; activity; age; injury event; equipment location; working location; tools, machinery, appliances, structures, surfaces (etc.); and assigned cause of injury. The calculated frequencies for the 14 variables are shown in Table 5-4 for 929 Severe Injuries that occurred

¹³ The Severe Injury data was taken from the Federal Railroad Administration Office of Safety's Web site in June 2004.

among the nineteen, 600-series (train and engine service) job codes from January 1, 1997 to December 31, 2003.

Table 5-4: SOFA-defined Severe Injuries by 14 Attributes and 7 Track Locations January 1, 1997 to December 31, 2003									
	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
JOB CODE									
conductor, yard-614	107	14	30	1	0	0	2	154	16.6%
brakeman, yard-615	90	10	19	1	0	0	5	125	13.5%
conductor, road freight-608	46	68	10	9	9	0	6	148	15.9%
engineer, road freight-617	38	43	1	6	9	0	5	102	11.0%
brakeman, road freight local-613	37	22	14	6	1	0	2	82	8.8%
conductor, road freight local-609	36	32	23	13	0	0	2	106	11.4%
engineer, yard-619	31	4	2	1	2	0	2	42	4.5%
conductor, road passenger-606	18	12	0	0	1	4	3	38	4.1%
engineer, road freight-618	16	9	1	2	2	0	0	30	3.2%
engineer, road passenger-616	14	10	0	0	0	2	0	26	2.8%
brakeman, road freight through-612	10	6	8	5	1	0	0	30	3.2%
switch tender-601	6	3	2	0	0	0	0	11	1.2%
conductor, asst. road passenger-607	5	4	0	0	0	8	1	18	1.9%
hostler, outside-603	3	0	0	0	0	0	0	3	0.3%
brakeman, lead passenger-611	2	1	0	0	0	0	0	3	0.3%
miscellaneous-600	1	0	1	1	0	0	1	4	0.4%
hostler, inside-605	1	0	0	0	0	0	0	1	0.1%
fireman, yard-623	1	0	0	0	0	0	0	1	0.1%
other	3	0	1	0	0	0	1	5	0.5%
column totals	465	238	112	45	25	14	30	929	100.0%
	50%	26%	12%	5%	3%	2%	3%	100.0%	
INJURY TYPE									
fracture-70	368	202	90	40	25	13	26	764	82.2%
amputation-80	83	25	16	3	0	0	2	129	13.9%
other burns-50	9	8	6	2	0	1	2	28	3.0%
electric shock/burns-40	4	2	0	0	0	0	0	6	0.6%
dislocation-60	1	1	0	0	0	0	0	2	0.2%
column totals	465	238	112	45	25	14	30	929	100.0%
	50%	26%	12%	5%	3%	2%	3%	100.0%	

Table 5-4: Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2003	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
INJURY LOCATION									
leg or foot	246	113	64	20	3	0	18	464	49.9%
torso	147	81	31	18	18	6	8	309	33.3%
arm or hand	41	20	10	1	3	7	2	84	9.0%
head or face	28	20	7	3	0	1	2	61	6.6%
various body parts-equal severity	3	4	0	3	1	0	0	11	1.2%
column totals	465	238	112	45	25	14	30	929	100.0%
	50%	26%	12%	5%	3%	2%	3%	100.0%	
YEAR									
1997	72	28	23	5	4	1	6	139	15.0%
1998	66	32	18	12	3	0	6	137	14.7%
1999	67	31	16	6	4	3	8	135	14.5%
2000	73	39	18	1	3	4	1	139	15.0%
2001	73	34	17	9	3	1	3	140	15.1%
2002	59	35	12	7	2	5	3	123	13.2%
2003	55	39	8	5	6	0	3	116	12.5%
column totals	465	238	112	45	25	14	30	929	100.0%
	50%	26%	12%	5%	3%	2%	3%	100.0%	
MONTH									
Jan	55	19	11	3	4	2	5	99	10.7%
Feb	48	23	6	4	3	0	5	89	9.6%
Mar	46	21	13	1	0	2	4	87	9.4%
Apr	29	16	9	2	2	1	2	61	6.6%
May	32	22	5	4	3	1	3	70	7.5%
Jun	30	15	7	1	5	0	3	61	6.6%
Jul	33	14	11	6	0	0	0	64	6.9%
Aug	35	25	8	3	2	0	0	73	7.9%
Sep	46	13	14	4	1	5	0	83	8.9%
Oct	37	17	7	7	3	1	3	75	8.1%
Nov	34	29	10	4	1	1	2	81	8.7%
Dec	40	24	11	6	1	1	3	86	9.3%
column totals	465	238	112	45	25	14	30	929	100.0%
	50%	26%	12%	5%	3%	2%	3%	100.0%	

Table 5-4: Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2003	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
DAY									
Sunday	66	18	8	7	9	4	3	115	12.4%
Monday	67	36	15	9	2	1	2	132	14.2%
Tuesday	64	41	19	7	4	1	6	142	15.3%
Wednesday	64	32	13	6	4	4	7	130	14.0%
Thursday	70	40	23	8	4	2	5	152	16.4%
Friday	74	38	20	1	2	1	5	141	15.2%
Saturday	60	33	14	7		1	2	117	12.6%
column totals	465	238	112	45	25	14	30	929	
	50%	26%	12%	5%	3%	2%	3%	100.0%	100.0%
TIME OF DAY									
00:00-01:00	28	17	6	3	3	0	2	59	6.4%
01:01-02:00	24	12	4	2	2	0	0	44	4.7%
02:01-03:00	22	10	3	1	0	0	1	37	4.0%
03:01-04:00	27	11	1	1	2	1	0	43	4.6%
04:01-05:00	17	2	0	2	1	1	1	24	2.6%
05:01-06:00	10	7	5	5	1	1	3	32	3.4%
06:01-07:00	5	9	3	1	0	0	1	19	2.0%
07:01-08:00	13	11	0	4	2	2	3	35	3.8%
08:01-09:00	21	10	5	1	0	0	1	38	4.1%
09:01-10:00	27	9	5	1	1	0	4	47	5.1%
10:01-11:00	14	11	6	2	1	0	1	35	3.8%
11:01-12:00	18	12	6	1	1	1	2	41	4.4%
12:01-13:00	21	13	11	2	1	0	1	49	5.3%
13:01-14:00	16	10	13	0	1	0	0	40	4.3%
14:01-15:00	19	15	2	1	1	1	3	42	4.5%
15:01-16:00	21	7	2	1	1	1	0	33	3.6%
16:01-17:00	22	13	4	2	0	0	0	41	4.4%
17:01-18:00	21	8	6	3	2	1	0	41	4.4%
18:01-19:00	19	8	7	2	0	1	1	38	4.1%
19:01-20:00	24	6	6	2	0	1	1	40	4.3%
20:01-21:00	19	11	4	2	0	2	2	40	4.3%
21:01-22:00	22	13	6	4	2	1	1	49	5.3%
22:01-23:00	23	6	2	1	3	0	1	36	3.9%
23:01-24:00	12	7	5	1	0	0	1	26	2.8%
column totals	465	238	112	45	25	14	30	929	100.0%
	50%	26%	12%	5%	3%	2%	3%	100.0%	

Table 5-4: Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2003									
	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
ACTIVITY									
walking	123	59	29	14	1	4	10	240	25.8%
riding	64	35	26	8	20	0	0	153	16.5%
getting off	57	25	14	6	0	1	1	104	11.2%
stepping down	34	22	7	3	0	4	6	76	8.2%
getting on	20	5	4	1	0	2	0	32	3.4%
standing	17	7	4	0	1	1	3	33	3.6%
climbing over/on	14	5	4	3	0	0	0	26	2.8%
adjusting coupler	13	0	0	0	0	0	0	13	1.4%
coupling air hose	11	0	0	1	0	0	0	12	1.3%
operating	10	16	1	2	1	0	0	30	3.2%
lining switches	10	5	3	0	0	0	0	18	1.9%
pulling pin/uncoupling	10	2	2	1	0	0	0	15	1.6%
crossing over	10	1	1	2	0	0	0	14	1.5%
stepping	8	2	0	0	0	0	1	11	1.2%
closing	7	4	1	0	0	0	0	12	1.3%
75... unknown	6	0	1	1	0	0	0	8	0.9%
other	5	4	4	0	0	0	1	14	1.5%
74... unknown	5	1	1	1	0	0	1	9	1.0%
adjusting, other	5	0	0	0	0	0	1	6	0.6%
jumping from	4	15	3	0	0	0	0	22	2.4%
opening	4	7	0	0	0	0	0	11	1.2%
stepping over	4	3	0	0	0	0	0	7	0.8%
inspecting	3	3	0	0	0	0	0	6	0.6%
sitting	2	5	0	0	1	0	1	9	1.0%
reaching	2	0	1	0	0	0	1	4	0.4%
coupling electric cables	2	0	0	0	0	0	0	2	0.2%
handling car parts	2	0	0	0	0	0	0	2	0.2%
pushing	2	0	0	0	0	0	0	2	0.2%
opening/closing angle cock	1	2	1	0	0	0	0	4	0.4%
bending, stooping	1	0	1	0	0	0	0	2	0.2%
crossing between	1	0	1	0	0	0	0	2	0.2%
driving (vehicle...)	1	0	0	0	1	0	1	3	0.3%
handling material, general	1	0	0	0	0	0	0	1	0.1%
pulling	1	0	0	0	0	0	0	1	0.1%
uncoupling air hose	1	0	0	0	0	0	1	2	0.2%
handling other	0	3	1	0	0	0	0	4	0.4%
jumping onto	0	1	1	0	0	0	0	2	0.2%
cleaning	0	1	0	1	0	0	0	2	0.2%
flagging	0	1	0	0	0	0	0	1	0.1%
handling loc parts	0	1	0	0	0	0	0	1	0.1%
not coded	0	1	0	0	0	0	1	2	0.2%
chaining, cabling car or locomotive	0	0	1	0	0	0	0	1	0.1%
cutting, other	0	0	0	0	0	0	1	1	0.1%
handling baggage	0	0	0	0	0	1	0	1	0.1%
loading/unloading	0	0	0	0	0	1	0	1	0.1%

Table 5-4: Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2003	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
repairing	1	0	0	0	0	0	0	1	0.1%
running	3	1	0	1	0	0	0	5	0.5%
welding	0	1	0	0	0	0	0	1	0.1%
column totals	465	238	112	45	25	14	30	929	100.0%
	50%	26%	12%	5%	3%	2%	3%	100.0%	
AGE									
15-20	2	0	0	0	0	0	0	2	0.2%
21-26	20	7	9	2	0	0	0	38	4.1%
27-32	53	22	12	5	1	1	2	96	10.3%
33-38	54	22	11	3	3	4	3	100	10.8%
39-44	53	35	10	3	7	1	7	116	12.5%
45-50	88	60	28	10	6	2	10	204	22.0%
51-56	107	51	24	15	4	5	2	208	22.4%
57-62	74	36	17	6	3	1	5	142	15.3%
63-68	14	4	1	1	1	0	1	22	2.4%
69-74	0	1	0	0	0	0	0	1	0.1%
column totals	465	238	112	45	25	14	30	929	100.0%
	50%	26%	12%	5%	3%	2%	3%	100.0%	

Table 5-4: Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2003									
	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
INJURY EVENT									
slipped, fell, stumbled, etc. due to object...	57	38	10	3	1	2	1	112	12.1%
70-unknown	51	23	13	5	0	1	4	97	10.4%
slipped, fell, stumbled, etc. due to climatic...	49	15	9	6	0	1	9	89	9.6%
struck by on-track equipment	44	10	7	2	0	0	0	63	6.8%
lost balance	42	15	9	3	0	4	1	74	8.0%
slipped, fell, stumbled, etc. due to irregular...	30	20	4	8	0	1	4	67	7.2%
missed handhold, grabiron, step, etc.	21	5	6	4	0	0	1	37	4.0%
struck against object	20	5	13	1	1	1	2	43	4.6%
68... unknown	15	4	1	0	0	1	0	21	2.3%
collision between on-track equipment	14	25	2	3	0	0	0	44	4.7%
other (describe in narrative)	13	7	6	0	1	0	0	27	2.9%
sudden/unexpected movement of on-track equipment	12	5	2	0	4	0	0	23	2.5%
slack action, draft, compressive buff/coupling	12	4	0	1	0	0	0	17	1.8%
stepped on object	11	3	2	0	0	0	1	17	1.8%
slipped, fell, stumbled, etc. on oil, grease	10	1	1	1	0	0	1	14	1.5%
derailments	8	7	3	0	0	0	0	18	1.9%
struck by object	6	9	6	0	0	0	0	21	2.3%
defective/malfunctioning equipment	6	2	2	0	0	0	0	10	1.1%
exposure to chemicals-external	5	4	3	0	0	1	0	13	1.4%
ran into object/equipment	5	0	1	1	0	0	0	7	0.8%
caught in or crushed by materials	4	1	1	1	0	0	0	7	0.8%
overexertion	3	2	1	1	0	1	0	8	0.9%
bodily function/sudden movement, e.g., sneezing	3	2	0	0	0	0	0	5	0.5%
sudden/unexpected movement of on-track equipment	2	5	0	0	0	0	1	8	0.9%
sudden/unexpected movement of material	2	1	2	0	0	0	1	6	0.6%
69... unknown	2	1	0	0	0	0	0	3	0.3%
caught in or compressed by other machinery	2	1	0	0	0	0	1	4	0.4%
ran into on-track equipment	2	1	0	1	0	0	0	4	0.4%
struck by thrown or propelled object	2	0	1	0	0	0	0	3	0.3%
collision/impact-auto, truck, bus, van, etc.	2	0	0	0	18	0	0	20	2.2%
electric shock due to contact with third rail	2	0	0	0	0	0	0	2	0.2%
71... unknown	1	2	1	0	0	0	0	4	0.4%
other impacts on-track equipment	1	1	1	1	0	0	0	4	0.4%
pushed/shoved into/against	1	1	0	1	0	0	0	3	0.3%
struck by falling object	1	0	2	0	0	0	2	5	0.5%
highway-rail collision/impact	0	16	2	0	0	0	0	18	1.9%
assaulted by other	0	0	0	0	0	0	0	0	0.0%
climatic conditions, other (e.g., high winds)	0	0	0	0	0	0	1	1	0.1%

Table 5-4: Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2003									
	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
exposure to welding light	0	0	0	0	0	0	0	0	0.0%
pushed/shoved onto	1	0	1	0	0	0	0	2	0.2%
pushed/shove from. . .	0	0	0	0	0	1	0	1	0.1%
rubbed, abraded, etc.	1	0	0	0	0	0	0	1	0.1%
cave in, slide, etc.	0	1	0	0	0	0	0	1	0.1%
sudden release of air	0	1	0	0	0	0	0	1	0.1%
aggregated pre-existing condition	0	0	0	1	0	0	0	1	0.1%
sustained viewing	0	0	0	1	0	0	0	1	0.1%
76. . . unknown	1	0	0	0	0	0	0	1	0.1%
80. . . unknown	1	0	0	0	0	0	0	1	0.1%
column totals	465	238	112	45	25	14	30	929	100.0%
	50%	26%	12%	5%	3%	2%	3%	100.0%	

Table 5-4: Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2003									
	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
EQUIPMENT LOCATION									
freight car moving	88	18	31	6	0	0	0	143	15.4%
other non-equip	63	37	17	5	2	1	18	143	15.4%
freight train moving	55	64	24	10	1	0	0	154	16.6%
freight train standing	70	37	6	13	0	0	1	127	13.7%
locomotive standing	76	33	8	6	0	1	4	128	13.8%
freight car standing	45	11	18	5	0	0	2	81	8.7%
locomotive moving	38	14	4	0	0	0	0	56	6.0%
pass train moving	2	11	0	0	0	3	1	17	1.8%
pass train standing	13	4	0	0	0	7	1	25	2.7%
auto	6	0	0	0	4	2	0	12	1.3%
pass car standing	4	1	0	0	0	0	1	6	0.6%
pass car moving	0	1	0	0	0	0	0	1	0.1%
van passenger	0	0	0	0	9	0	1	10	1.1%
taxi	0	0	0	0	9	0	0	9	1.0%
crane	0	1	0	0	0	0	0	1	0.1%
loaders, etc.	0	0	1	0	0	0	1	2	0.2%
other equip	1	1	0	0	0	0	0	2	0.2%
other on-track equip moving	0	0	1	0	0	0	0	1	0.1%
other on-track equip standing	0	1	0	0	0	0	0	1	0.1%
truck	0	1	1	0	0	0	0	2	0.2%
excavating equip	1	0	0	0	0	0	0	1	0.1%
van utility	1	0	0	0	0	0	0	1	0.1%
other operating equip	1	0	0	0	0	0	0	1	0.1%
camp car moving	0	1	0	0	0	0	0	1	0.1%
maintenance equip moving	0	1	0	0	0	0	0	1	0.1%
inspection vehicle moving	0	1	0	0	0	0	0	1	0.1%
unknown	1	0	1	0	0	0	0	2	0.2%
column totals	465	238	112	45	25	14	30	929	100.0%
	50%	26%	12%	5%	3%	2%	3%	100.0%	

Table 5-4: Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2003	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
WORKING LOCATION									
near on-track equip-on ground	91	32	25	6	0	0	2	156	16.8%
beside track	76	36	25	8	2	0	2	149	16.0%
on side of car	65	15	29	7	1	1	0	118	12.7%
in/on loc	60	73	4	10	0	1	3	151	16.3%
on end of car	30	9	12	6	0	1	1	59	6.4%
other location on loc	25	10	2	1	0	0	2	40	4.3%
between cars/loc	25	6	3	2	0	0	1	37	4.0%
between tracks	24	5	5	0	0	0	0	34	3.7%
on track	19	4	1	2	0	0	0	26	2.8%
on ladder	14	3	0	1	0	0	0	18	1.9%
other location	9	2	1	0	0	0	1	13	1.4%
on stairs	8	8	2	0	0	1	5	24	2.6%
at work station	7	6	0	0	0	5	8	26	2.8%
on platform	5	8	3	0	0	4	2	22	2.4%
on bridge/trestle	3	5	0	0	0	0	0	8	0.9%
in car	2	9	0	1	3	1	0	16	1.7%
under car	1	1	0	0	0	0	0	2	0.2%
in/operating vehicle	1	0	0	0	17	0	1	19	2.0%
on highway-rail crossing	0	6	0	0	2	0	0	8	0.9%
in tower	0	0	0	0	0	0	1	1	0.1%
on pole/signal mast	0	0	0	1	0	0	0	1	0.1%
under loc	0	0	0	0	0	0	1	1	0.1%
column totals	465	238	112	45	25	14	30	929	100.0%
	50%	26%	12%	5%	3%	2%	3%	100.0%	

Table 5-4: Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2003	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
TOOLS, MACHINERY, APPLIANCES,									
STRUCTURES, SURFACES (ETC.)									
ground	160	70	38	11	0	1	9	289	31.1%
other	53	27	24	4	0	1	8	117	12.6%
ballast	49	30	8	8	0	0	2	97	10.4%
ladder	28	9	12	3	0	0	0	52	5.6%
36...unknown	25	2	3	4	0	0	0	34	3.7%
grabiron	20	5	4	2	0	0	0	31	3.3%
coupler	20	2	2	0	0	0	0	24	2.6%
floor	14	22	1	3	2	1	3	46	5.0%
switch	13	2	5	3	0	0	0	23	2.5%
door	12	11	1	0	0	1	1	26	2.8%
tie	11	2	2	2	0	0	0	17	1.8%
stair	9	13	1	1	0	1	6	31	3.3%
43...unknown	9	2	0	3	0	7	0	21	2.3%
37...unknown	8	0	0	0	0	0	0	8	0.9%
34...unknown	4	7	0	0	1	0	0	12	1.3%
hose	4	3	1	0	0	0	0	8	0.9%
baggage	4	1	0	0	0	1	0	6	0.6%
bridge/trestle	3	5	1	0	0	0	0	9	1.0%
42...unknown	3	2	1	0	1	0	0	7	0.8%
end of train device	3	1	0	1	0	0	0	5	0.5%
46...unknown	2	2	2	0	0	0	0	6	0.6%

Table 5-4: Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2003									
	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
41...unknown	2	0	0	0	0	0	0	2	0.2%
81...unknown	2	0	0	0	0	0	0	2	0.2%
window	2	0	0	0	0	0	0	2	0.2%
highway, street, road	1	9	2	0	18	0	0	30	3.2%
38...unknown	1	3	0	0	0	0	0	4	0.4%
caboose	1	1	0	0	0	0	0	2	0.2%
TOFC, COFC	1	1	0	0	0	0	0	2	0.2%
fusees/torpedoes	1	0	0	0	0	0	0	1	0.1%
derail	0	2	1	0	0	0	0	3	0.3%
40...unknown	0	1	0	0	0	0	0	1	0.1%
82...unknown	0	1	0	0	0	0	0	1	0.1%
87...unknown	0	1	0	0	0	0	0	1	0.1%
welder-electric	0	1	0	0	0	0	0	1	0.1%
35...unknown	0	0	1	0	0	0	0	1	0.1%
44...unknown	0	0	1	0	0	0	0	1	0.1%
cutting tools	0	0	1	0	0	0	0	1	0.1%
39...unknown	0	0	0	0	0	1	0	1	0.1%
not coded	0	0	0	0	3	0	0	3	0.3%
torch, acetylene, gas, etc.	0	0	0	0	0	0	1	1	0.1%
column totals	465	238	112	45	25	14	30	929	100.0%
	50%	26%	12%	5%	3%	2%	3%	100.0%	

Table 5-4: Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2003									
	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
ASSIGNED CAUSE OF INJURY									
human factors	193	100	35	21	13	8	12	382	41.1%
undetermined	130	80	43	12	8	1	10	284	30.6%
environmental	56	19	14	9	4	4	7	113	12.2%
equip procedures not followed	49	15	8	1	0	1	0	74	8.0%
equipment	27	13	7	1	0	0	0	48	5.2%
track	4	4	3	0	0	0	0	11	1.2%
other	3	1	1	0	0	0	0	5	0.5%
physical condition	2	2	0	0	0	0	0	4	0.4%
trespassing	1	2	0	0	0	0	0	3	0.3%
no safety equip	0	1	1	1	0	0	1	4	0.4%
substance use	0	1	0	0	0	0	0	1	0.1%
column totals	465	238	112	45	25	14	30	929	100.0%
	50%	26%	12%	5%	3%	2%	3%	100.0%	

5.5 Statements About Frequency of Serious Injuries by Track Location

To look at Severe Injuries for just yard and road crews, a slightly smaller group of track locations and job codes were used. This reduced set contained 843 Severe Injuries. Track locations used in the analysis below were yard, mainline/branch line, industry, and siding. The remaining three track locations (highway/roadway, passenger terminal, and other) were not used in this analysis. The following job codes were used for yard and road crews:

- Yard crews consist of 619-engineers, 623-firemen, 603-hostlers, outside, 601-switch tenders; 614-conductors, and 615 brakemen.
- Road crews consist of 616-passenger engineer, 617-through freight engineers, 618-local freight engineers, 606-passenger conductors, 607-assist. passenger conductors, 608-through freight conductors, 609-local freight conductors, 612-freight brakemen and flagmen, and 613-freight brakemen and flagmen.

The following observations, based on the information presented in Tables 5.4 and 5.5, are examples of how the Severe Injury data might be used in trying to understand the injury process. When there is mention of yard and road crews, the information came from the restricted number of job codes and track locations given in Table 4-5.

- The total number of Severe Injuries has remained nearly the same during the years 1997 thru 2001. There was a significant reduction in the number of Severe Injuries in 2002 and a further numerical reduction in 2003.
- There were significant reductions in Serious Injuries in the yard and at industries in 2002 and 2003. Serious Injuries in the yard have declined from 72 in 1997 to 55 in 2003, and from 23 in 1997 to 8 in 2003 at industries.
- Serious Injuries on main/branch line have increased from 28 in 1997 to a high of 39 in 2003.
- Over half (53.9%) the total number of Severe Injuries occurred in the yard during the years 1997 thru 2003.
- Forty-two percent of all Severe Injuries to road train and engine service crews occurred in yards. Road train and engine service crews sustained almost as many Severe Injuries in the yard as yard train and engine service crews. (220 vs. 234 Serious Injuries)
- During the seven-year period, yard train and engine service employees sustained 38.1 percent of the total Severe Injuries, while road train and engine service employees sustained 61.9 percent of the total Severe Injuries. (321 vs. 522 Serious Injuries)
- Yard engineers sustained 12.2 percent of the total number of Severe Injuries to yard crews, while road engineers sustained 26.7 percent of the total number of Severe Injuries to road crews. (39 of 321 vs. 139 of 522)
- Yard train service employees sustained 87.9 percent of the total Severe Injuries to yard crews, while road train service employees sustained 73.3 percent of the total number of Severe Injuries to road crews. (282 of 321 vs. 383 of 522)

- During the seven-year period, road freight engineers incurred 3.6 times as many Severe Injuries as yard engineers.
- There were significantly more Severe Injuries in the yard during the months of January (55), February (48), March (46), and September (46) than during the other months of the year. On the main/branch line, the fewest Serious Injuries occurred during the month of September (13), and the most during the month of November (29).
- There does not appear to be any significant differences in the day of the week when these Severe Injuries occurred in the yard.
- Significantly fewer Serious Injuries occur on main/branch line (18) and at industries (8) on Sunday, than during the other days of the week.
- Significantly more Severe Injuries occurred in the first hour after midnight than during any other time of the day or night. (6.4 percent of the total Serious Injuries).
- At all locations, many more Severe Injuries occurred to older employees, i.e., those over 38 years of age.
- Over 96 percent of the Severe Injuries during the data period were amputations and fractures.
- Severe Injuries are nine times more likely to affect legs and feet than hands and arms.
- There were four times as many amputation Severe Injuries in the yard (83) and at industries (16) than on the main track/branch line (25) for the same seven-year period.
- The proportion of “human factor” Possible Contributing Factor (PCF) Severe Injuries to the total Severe Injuries (41.1 percent) is about the same in the yard (41.5 percent) and on the main track/branch line (42.0 percent). The proportion of (PCF) Serious Injuries is lower, 31.3%, at industries.
- Over one half of the Severe Injuries in each identified location were impacted by “the ground, ballast, or floor” as the identified “tools, machinery, appliances, structures, surfaces, etc.”

Table 5-5. Severe Injuries by Selective Job Codes and Track Locations, 1997 to 2003

Job Code	yard	main or branch line	industry	siding	TOTAL
Conductor, road freight-608	46	68	10	9	133
Conductor, road freight local-609	36	32	23	12	103
Brakeman, road freight through-612	10	6	8	5	29
Brakeman, road freight local-613	37	22	14	6	79
Conductor, road passenger-606	18	12	0	0	30
Conductor, assist. road passenger-607	5	4	0	0	9
Total, Road Train Service	152	144	55	32	383
Conductor, yard-614	107	14	30	1	152
Brakeman, yard-615	89	10	19	1	119
Switch tender-601	6	3	2	0	11
Total, Yard Train Service	202	27	51	2	282
<i>Total, Train Service</i>	354	171	106	34	665
Engineer, road through freight-617	38	42	1	6	87
Engineer, road passenger-616	14	10	0	0	24
Engineer, road local freight-618	16	9	1	2	28
<i>Total, Road Engine Service</i>	68	61	2	8	139
Engineer, yard-619	30	4	2	1	37
Fireman, yard-623	1	0	0	0	1
Hostler, outside-603	1	0	0	0	1
<i>Total, Yard Engine Service</i>	32	4	2	1	39
<i>Total, Engine Service</i>	100	65	4	9	178
<i>ROAD, TRAIN & ENGINE</i>	220	205	57	40	522
<i>YARD, TRAIN & ENGINE</i>	234	31	53	3	321
TOTAL	454	236	110	43	843

5.6 Conclusion on Severe Injury Data

The SWG again looked at the injury data from the perspective of the knowledge gained from its detailed investigation of switching fatalities where the circumstances surrounding, and leading up to, an FE were identified. The SWG realized that Severe Injuries are not investigated or reported the way FEs are; hence, it is not always possible to identify these circumstances. The implication of this is clear; it is not possible for the SWG to tell if one or more of the five major safety recommendations applies to a particular Severe Injury event. The SWG makes this information in section 5 available in the interest of railroad safety.